IT Architecture

Information Technology Enterprise Architecture

Briefing to National Institute of Standards and Technology

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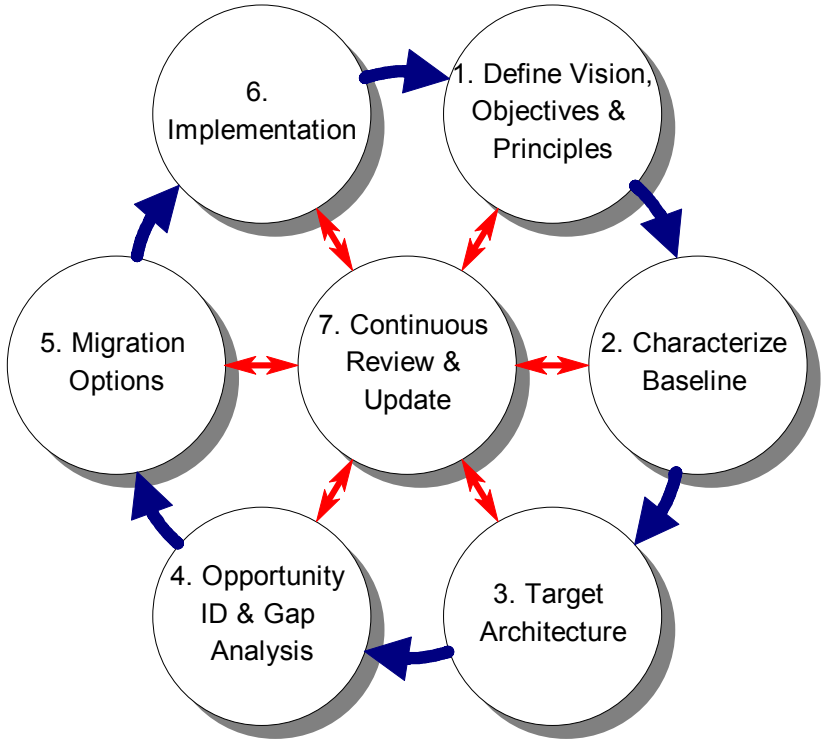
Department of Commerce IT Architecture Affinity Group

September 13, 2000

IT Architecture

Two Things to Remember



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IT Architecture

Outline

- **What is an IT Architecture?**
  - **Enterprise IT Architecture**
  - **Technical Reference Model**
  - **Standards Profile**
- Department of Commerce IT Architecture
- Lessons Learned

IT Architecture

Requirements for an IT Architecture

- **Clinger - Cohen Act** of 1996 requires IT Architecture
- Executive Order 13011, July 17, 1996, “Federal Information Technology”
- **OMB memorandum M-97-02**, October 25, 1996, “Funding Information Systems Investments”
  - OMB “Raines Rules” number 5: “Is the project consistent with ...bureau information architectures?”
- **OMB Memorandum M-97-16**, June 18, 1997, “Information Technology Architectures”

Requirements for an IT Architecture

- Dept of Commerce **CIO Memorandum May 28, 1999**, "CIO Council Decision"
- **Proposed Revision to OMB Circular No. A-130**, April 13, 2000, "Management of Federal Information Resources"
- **GAO** Exposure Draft, May 2000, Version 1, "Information Technology Investment Management, A Framework for Assessing and Improving Process Maturity"

What is an IT Architecture?

"An **integrated framework** for evolving or maintaining existing information technology and acquiring new information technology **to achieve the agency's strategic goals and information resources management goals**."

Clinger/Cohen Act - 1996

IT Architecture

What is an IT Architecture?

- **An integrated framework** for evolving or maintaining existing IT and acquiring new IT to achieve the organization's strategic and business goals.

- A complete IT Architecture should consist of both **logical and technical components**.
  - The logical architecture provides the **high-level description** of the agency's mission, functional requirements, information requirements, system components, and information flows among the components.
  - The technical architecture defines the **specific IT Standards and rules** that will be used to implement the logical architecture.

GAO/AIMD-10.1.23, May 2000 Version 1, "Information Technology Investment Management – A Framework for Accessing and Improving Process Maturity."

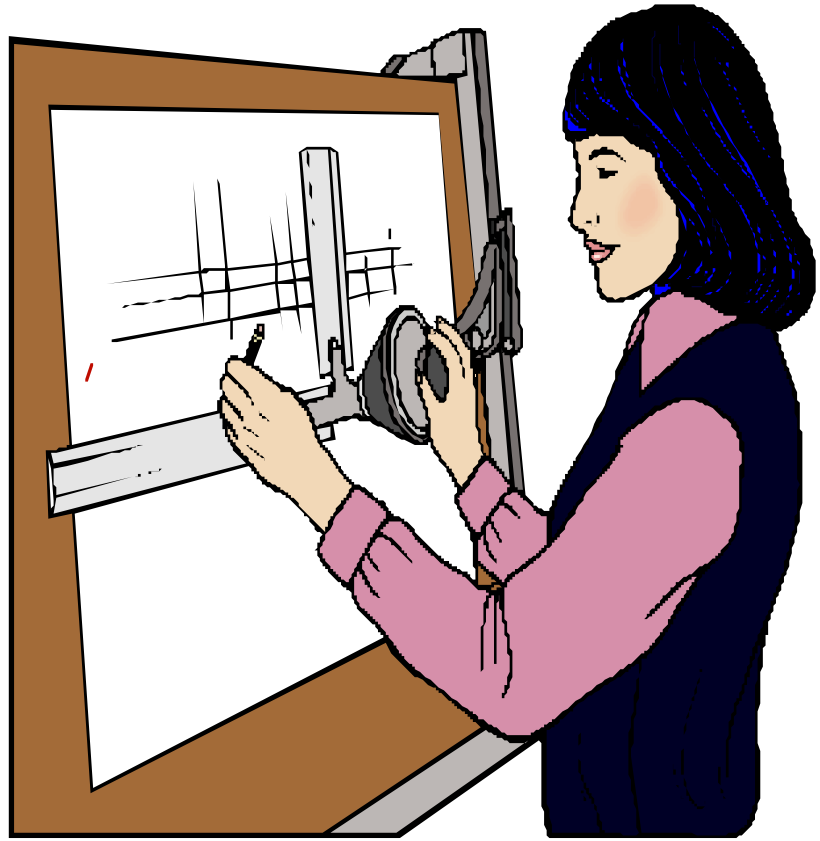
What is an IT Architecture?

- A **complete IT Architecture** documents the relationships among business and management processes and information technology
- An IT Architecture contains two elements:
  - **An Enterprise Architecture**
  - **A Technical Reference Model and Standards Profile**

OMB Memorandum M-97-16, June 18, 1997, "Information Technology Architectures"

What is an Enterprise IT Architecture?

- A blueprint that explains how all the IT Infrastructure and Management elements work together as a whole

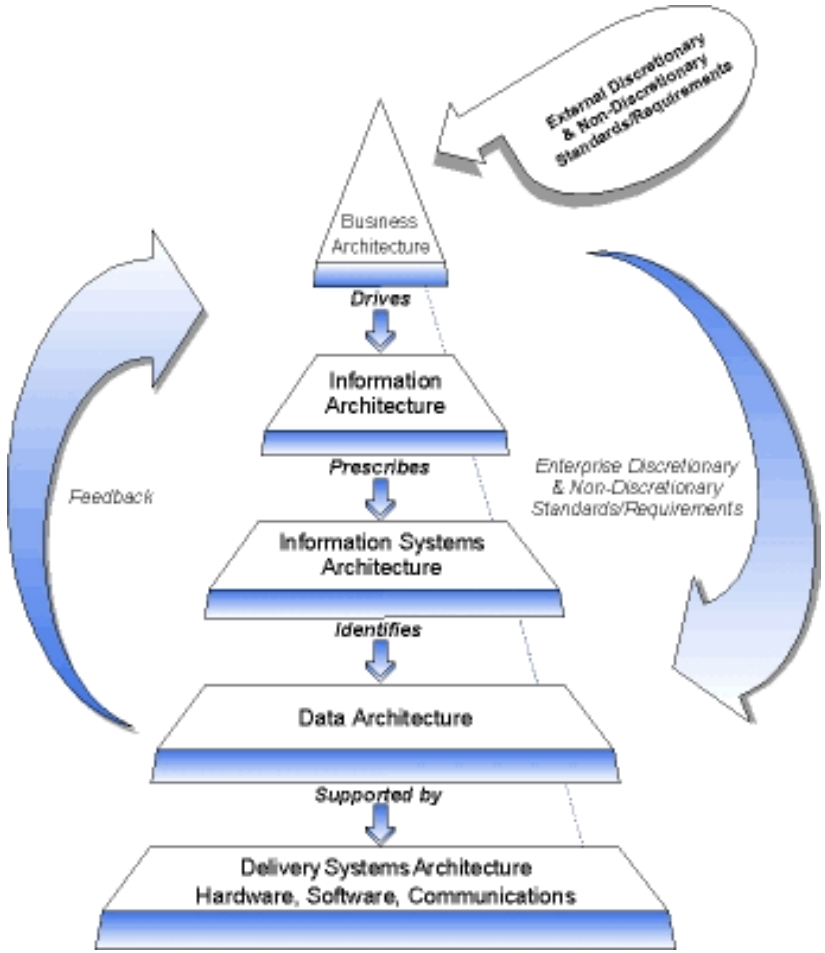


IT Architecture

What is an Enterprise IT Architecture?

- IT Architecture Components
  - Business Process
  - Information Flows and Relationships
  - Applications
  - Data Descriptions
  - Technology Infrastructure

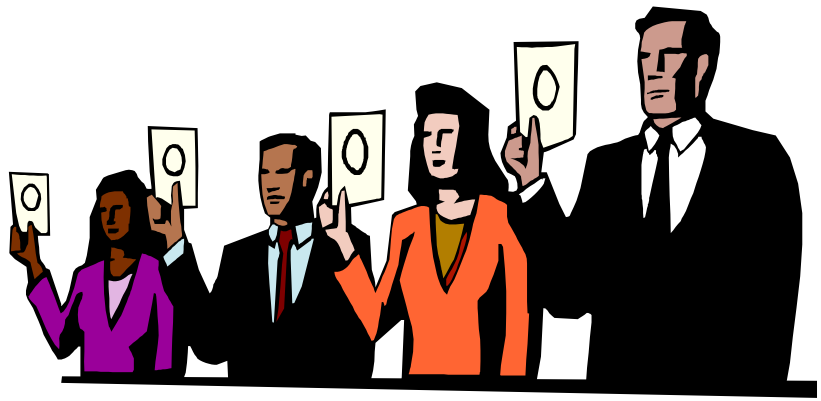
OMB Memorandum M-97-16, June 18, 1997, Information Technology Architectures



NIST Special Publication 500-167, Information Management Directions: The Integration Challenge"

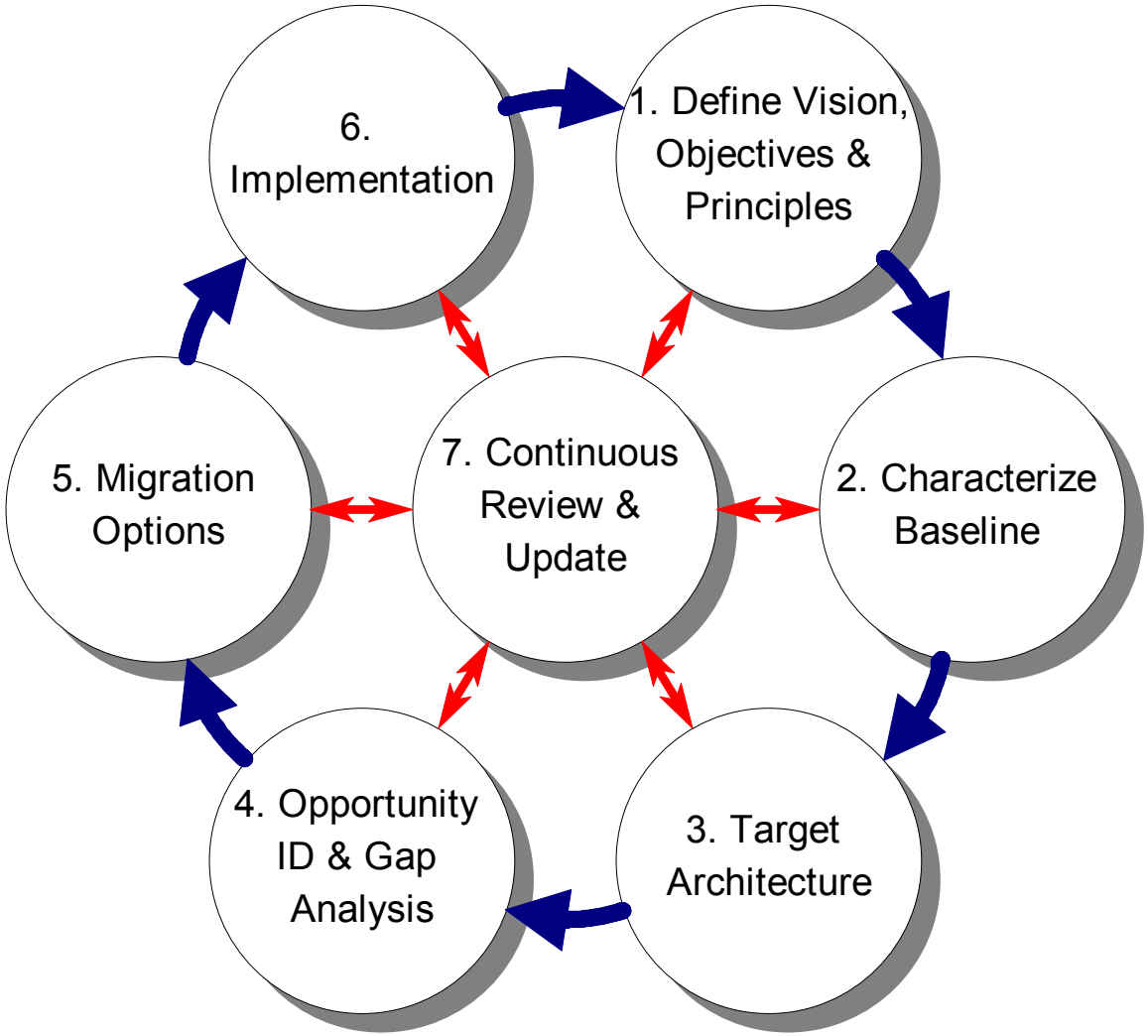
What is an Enterprise IT Architecture?

- Department of Commerce IT Architecture Views
  - Business Process
  - Data/Information
  - Applications
  - Technology Infrastructure (networks, telecommunications and computer hardware)



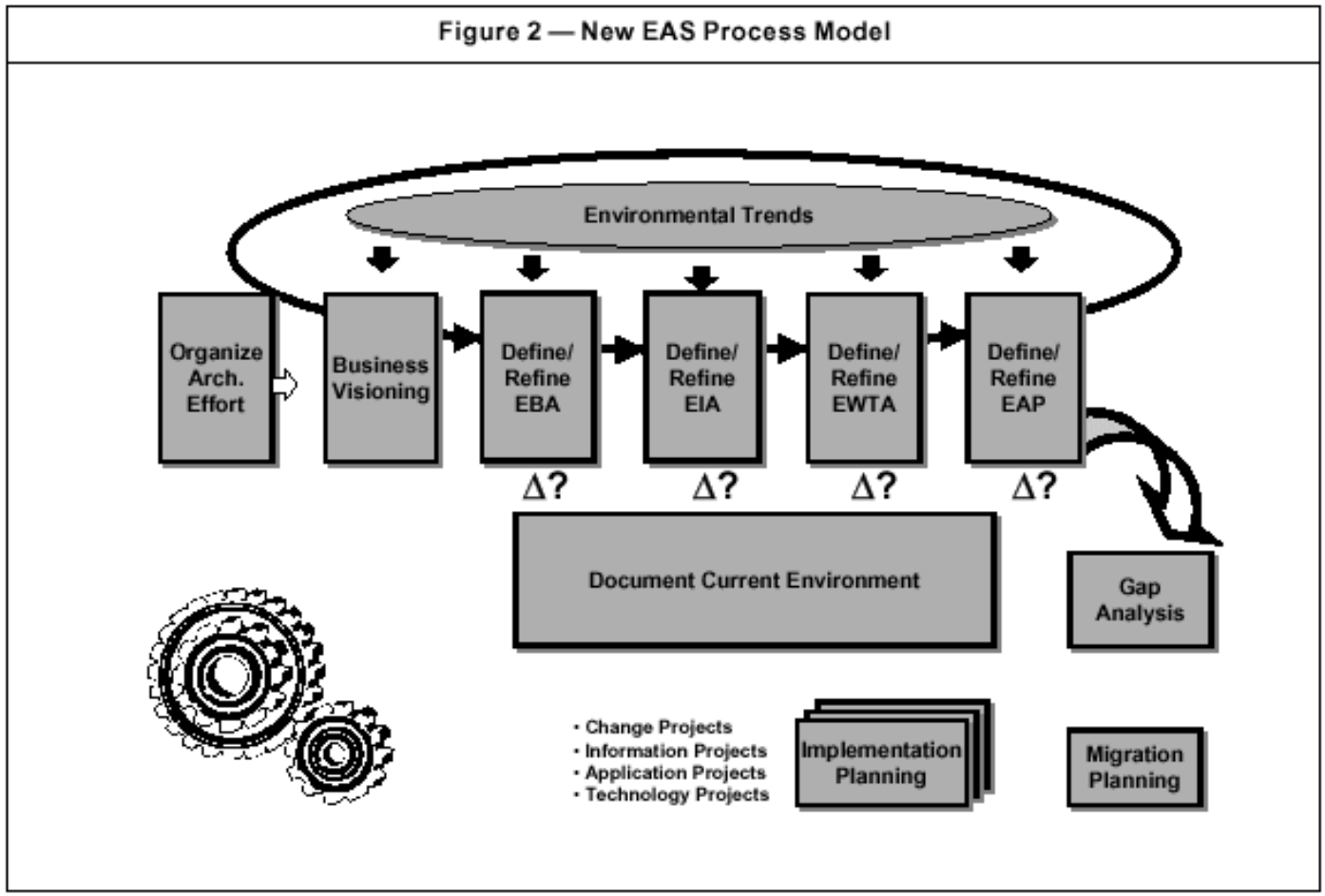
IT Architecture

Enterprise IT Architecture Process Model



IT Architecture

META Group ITA Process Model[1]

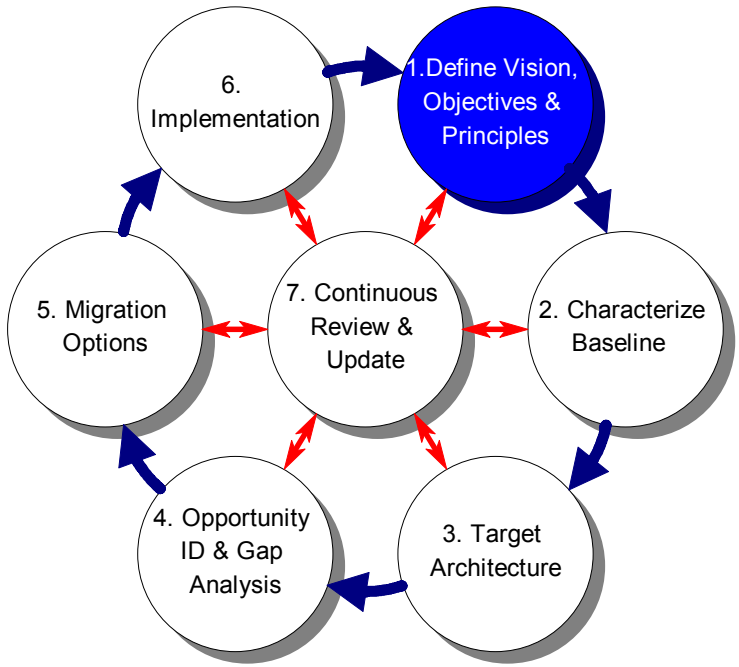


[1] **META Group Practice, Volume 4, Number 3, "EAS Process Model: Evolution 2000", April 2000**

IT Architecture

1. Define IT Vision, Objectives and Principles

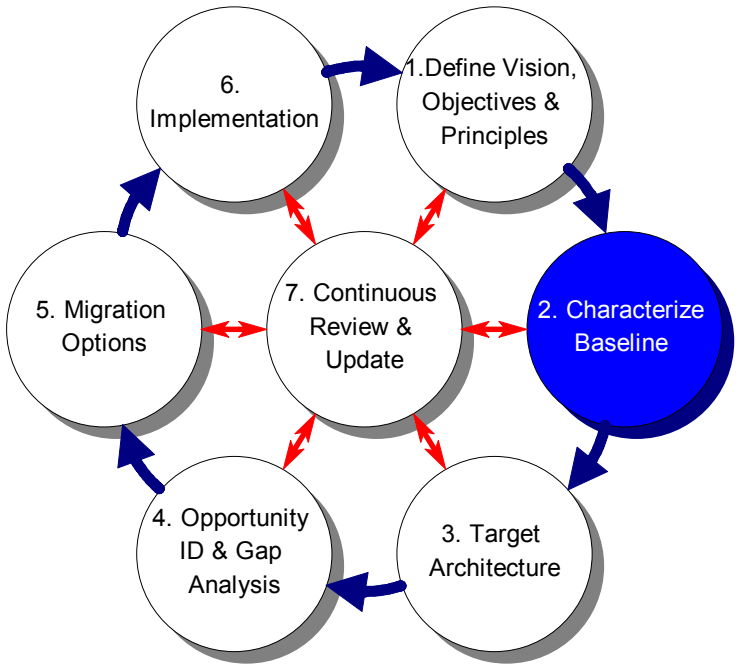
- Align the IT Architecture with strategic plan
- Determine business drivers
- Establish IT Architecture Vision and Objectives
- Clearly state and establish IT Architecture Principles
- Ascertain IT requirements and best practices
- Link the IT Architecture to the IT Capital Planning process
- Document Step 1 Activities



IT Architecture

2. Characterize IT Baseline

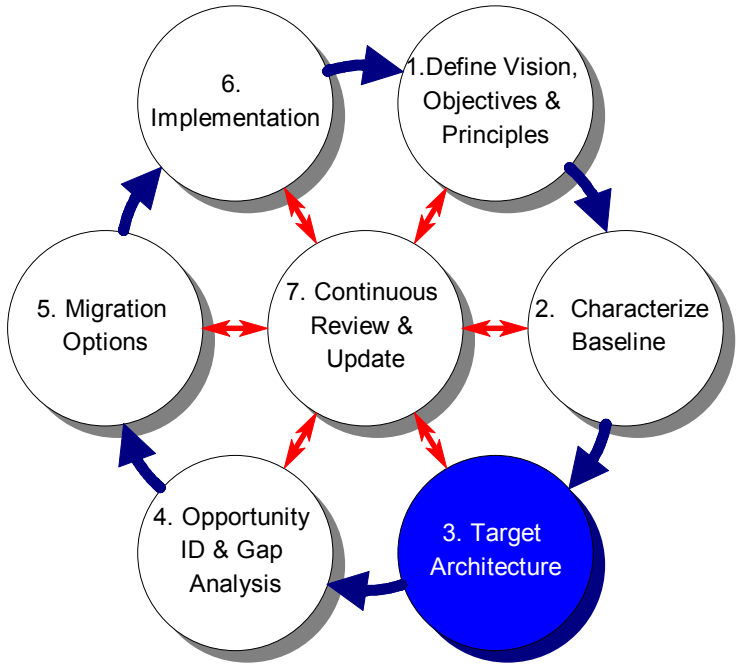
- Develop an inventory (IT Baseline) of existing Information Sets, Databases, Applications and Technology Infrastructure
- Identify the information and data flows within the bureau and with constituents and collaborators
- Document Step 2 Activities



IT Architecture

3. Create IT Target Architecture

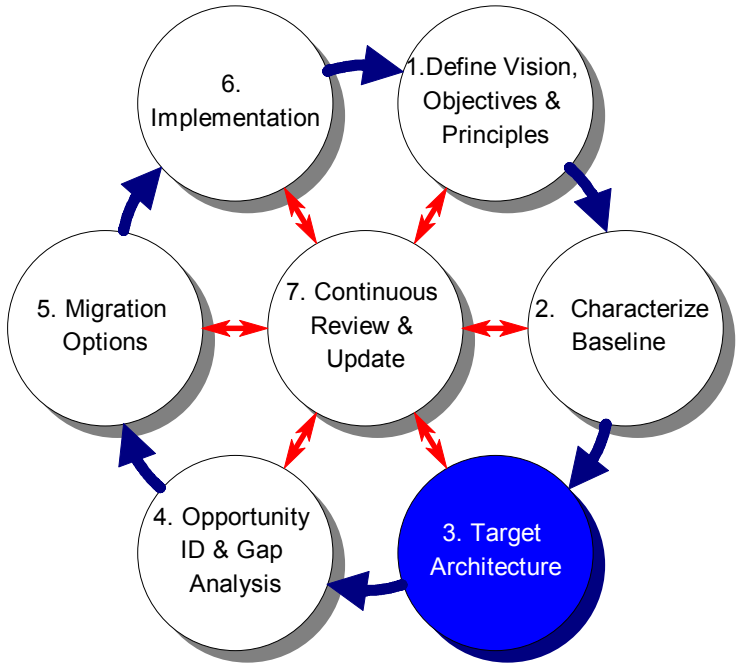
- Identify the Technology Drivers
- Model each view separately
- Define architectural components and their relationships
- Synthesize four views into a comprehensive Target Architecture
- Create a Target Architecture for each of the four IT Architecture views



IT Architecture

3. Create IT Target Architecture

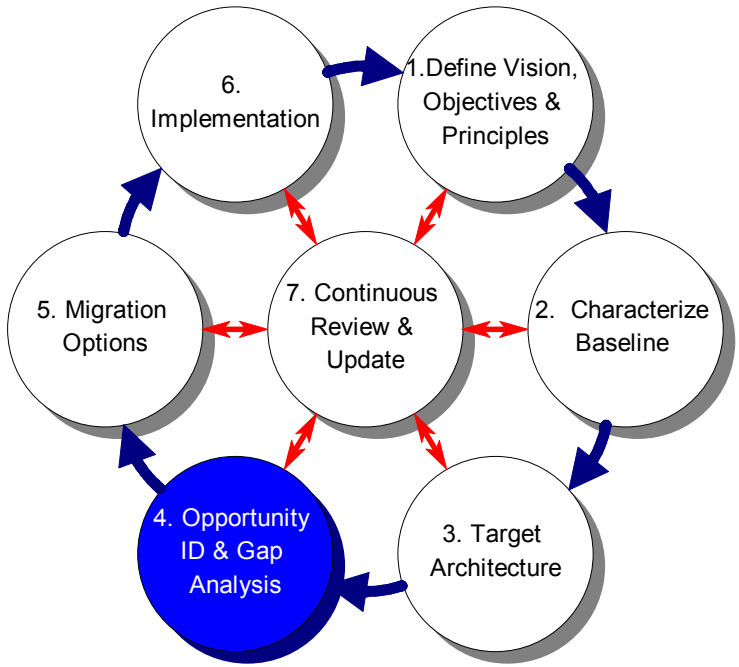
- Align the IT Target Architecture with the Department's Digital Department
- Develop Target Architecture Network Diagrams
- Develop a Technical Reference Model and a Standards Profile
- Link new IT Target Architecture initiatives the to the IT Capital Planning process
- Document Step 3 Activities



IT Architecture

4. Identify Immediate and Future Opportunities & Perform Gap Analysis

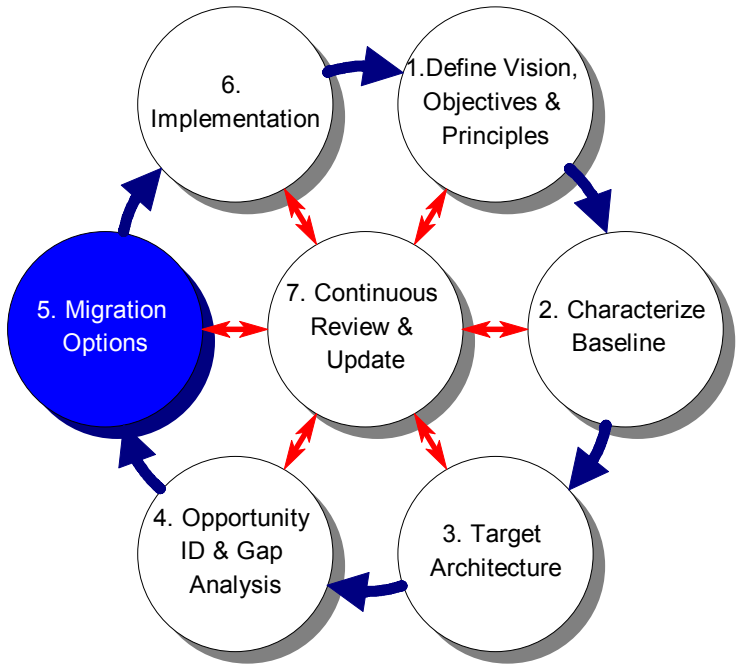
- Identify all projects necessary to achieve the IT Target Architecture
- Perform a Gap Analysis
- Identify short-term immediate opportunities
- Identify short term immediate opportunities that can result in visible ‘quick-win’ projects
- Document Step 4 Activities



IT Architecture

5. Develop Migration Options

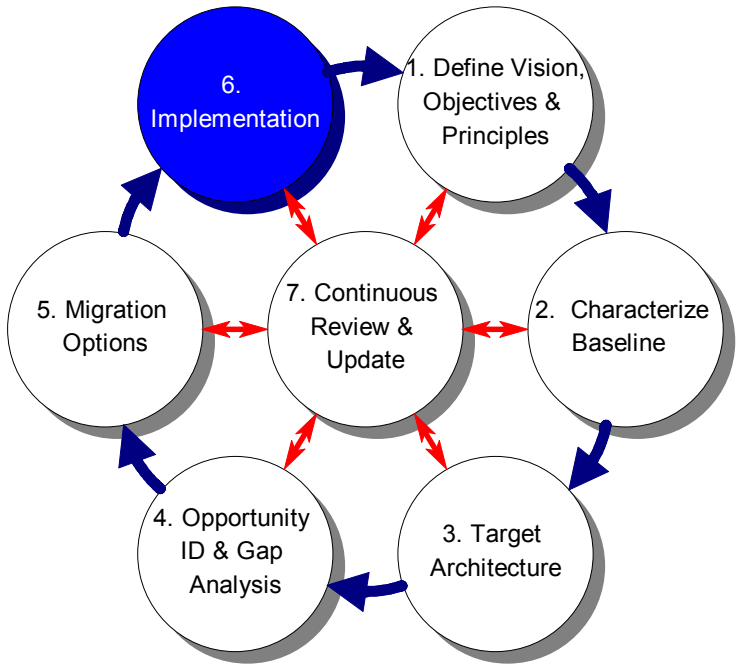
- Classify all projects as short (6 - 18 months), medium (18 - 36 months)and long (3 - 5 years) range
- Prioritize within each classification (short, medium and long range), all projects
- Establish and document Data Dictionaries, Software Developmental Methodologies and Configuration Management Processes
- Develop an IT Architecture Migration Plan
- Document Step 5 Activities



IT Architecture

6. Implement IT Target Architecture

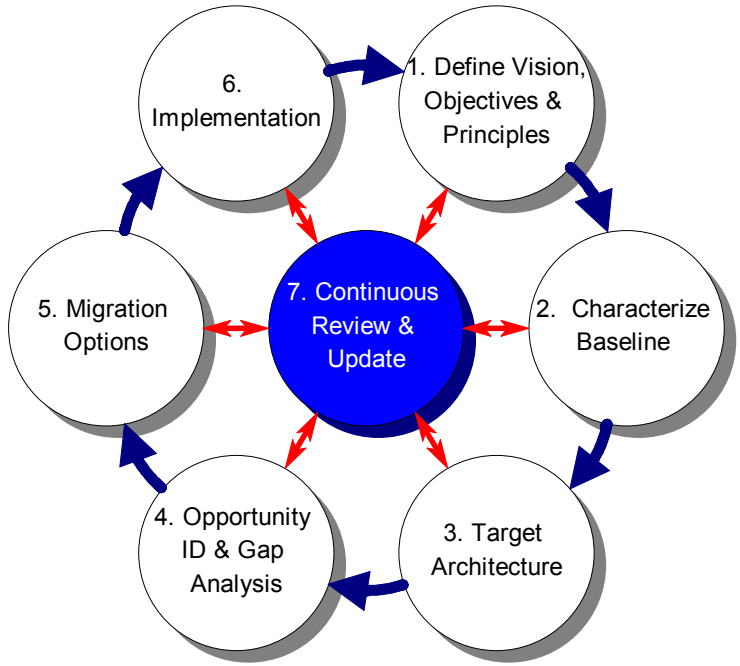
- Identify an IT Architecture project leader for each IT Architecture project to be implemented.
- Establish roles and responsibilities for IT Architecture project implementation.
- Establish a project plan and milestone schedule for each project.
- Document Step 6 Activities.



IT Architecture

7. Continuously Review and Update IT Enterprise Architecture

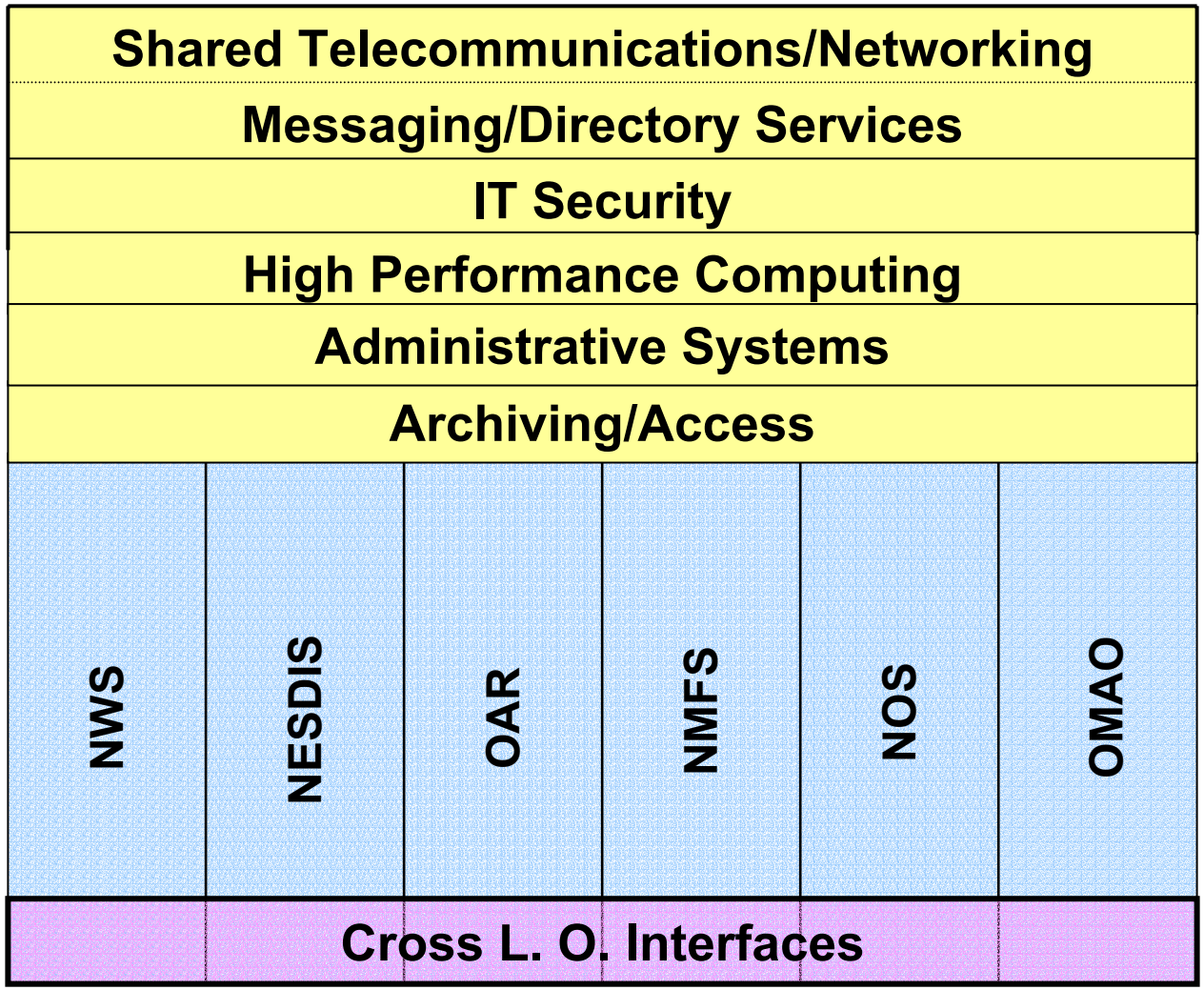
- Adjust the IT Enterprise Architecture decisions for unforeseen changes
- Make adjustments based on experience
- Ensure modifications reflect a realistic approach
- **Can cause a reentry into the process at any point**
- Update IT Architecture, as necessary



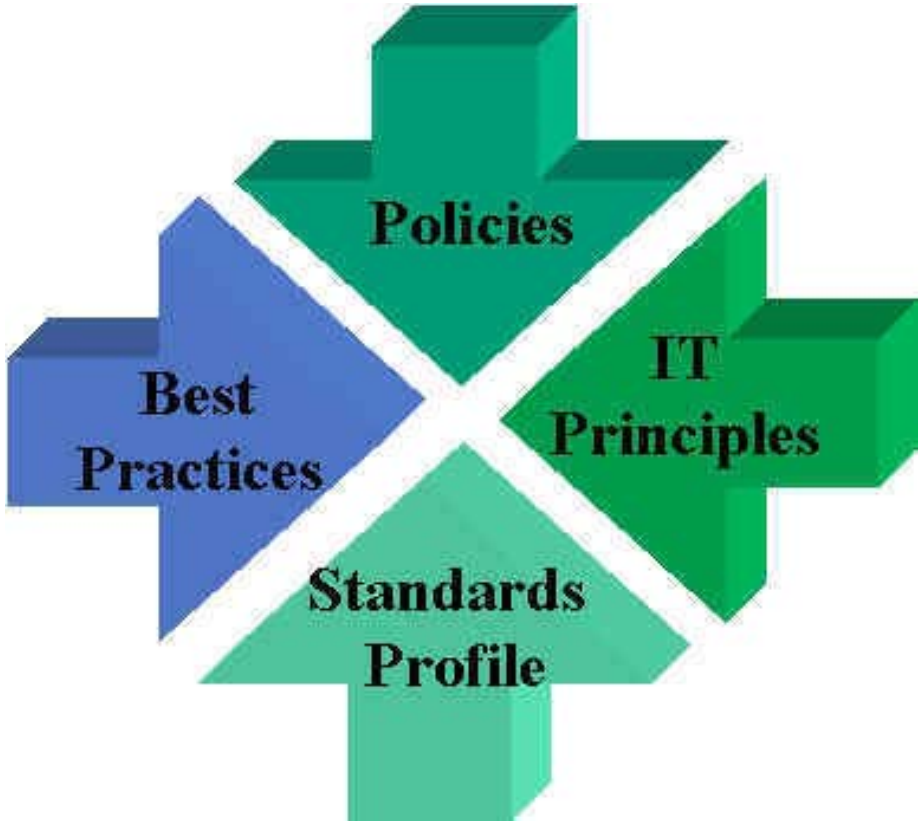
IT Architecture

NOAA IT Architecture Approach

IT Architecture = NOAA-wide + Line Office Segments



NMFS IT Architecture



Technical Reference Model

- Identifies and describes the information services used throughout the agency
  - *OMB Memorandum M-97-16*
- Derived from NIST Special Publication 500 – 230, Application Portability Profile, Version 3.0
- DOD Technical Reference Model, Version 1.0 5 November 1999
  - Integrates the service view and interface view of previous models to meet the requirements of increasingly diverse and complex systems
  - Can be tailored to support a wide range of requirements
  - **http://www-trm.itsi.disa.mil/**

Technical Reference Model

Service – A collection of components organized to accomplish a specific function or set of functions. *[IEEE] [C4ISR Version 2.0]*

Service Area – a higher level abstraction or category of services that consist of a number of lesser or subordinate grouped set of services. Also known as a "Service Category."

Service View – The view of the DoD TRM that contains all of the services contained within the entities of the model. Details of interfaces are not contained in this view of the model other than a high level Application Programming Interface (API) and an External Environment Interface (EEI).

Technical Reference Model

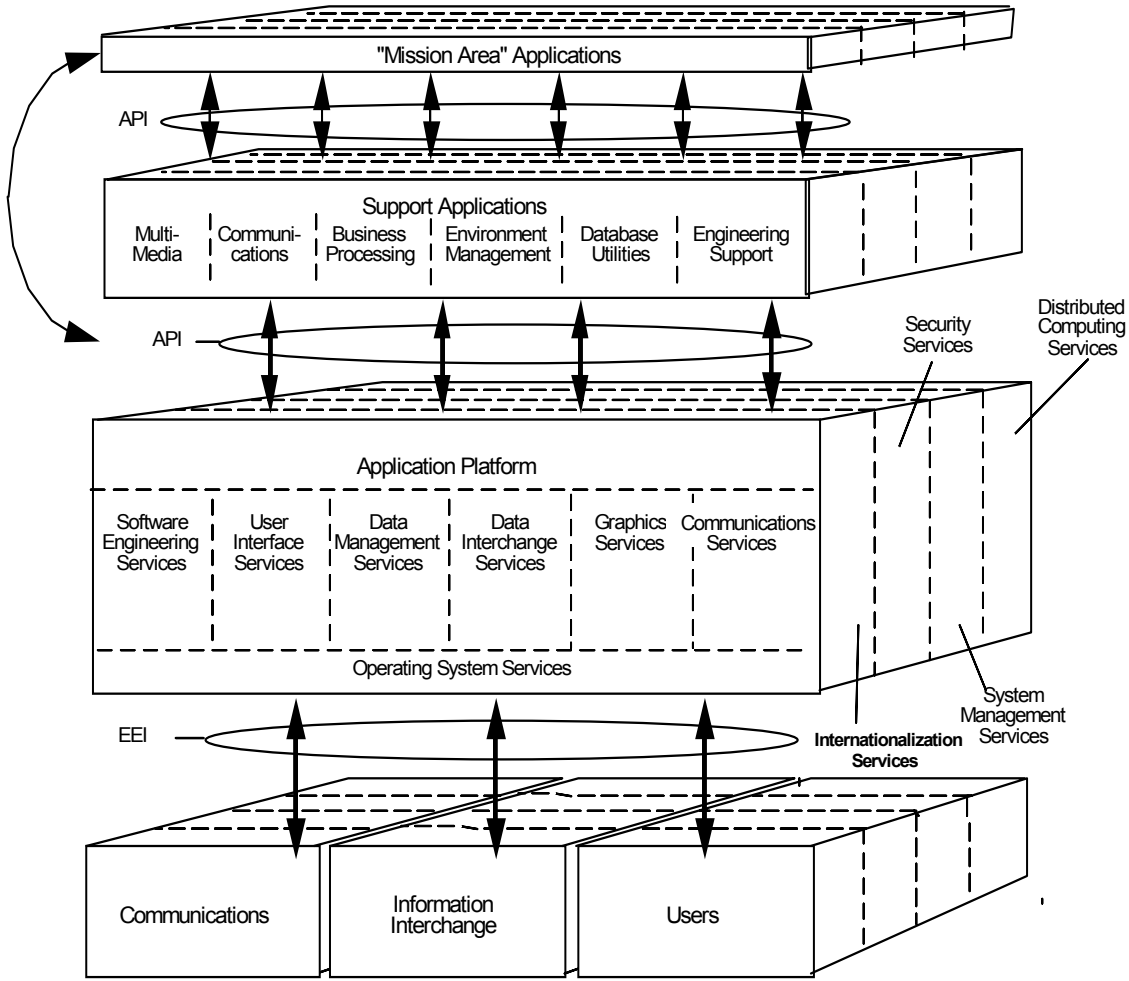
DoD Technical Reference Model Services

- Application Support Services
  - Multimedia
  - Communication
  - Business Process
  - Environmental Management
  - Database Utilization
  - Engineering Support
- Operating System Services
- Physical Environment Services
- System Services - Application Platform Entity
  - Software Engineering
  - User Interface
  - Data Management
  - Data Interchange
  - Graphic
- System Services - Application Program Interface
  - Communications
  - Security
  - System Management
  - Distributed Computing
  - Internationalization

IT Architecture

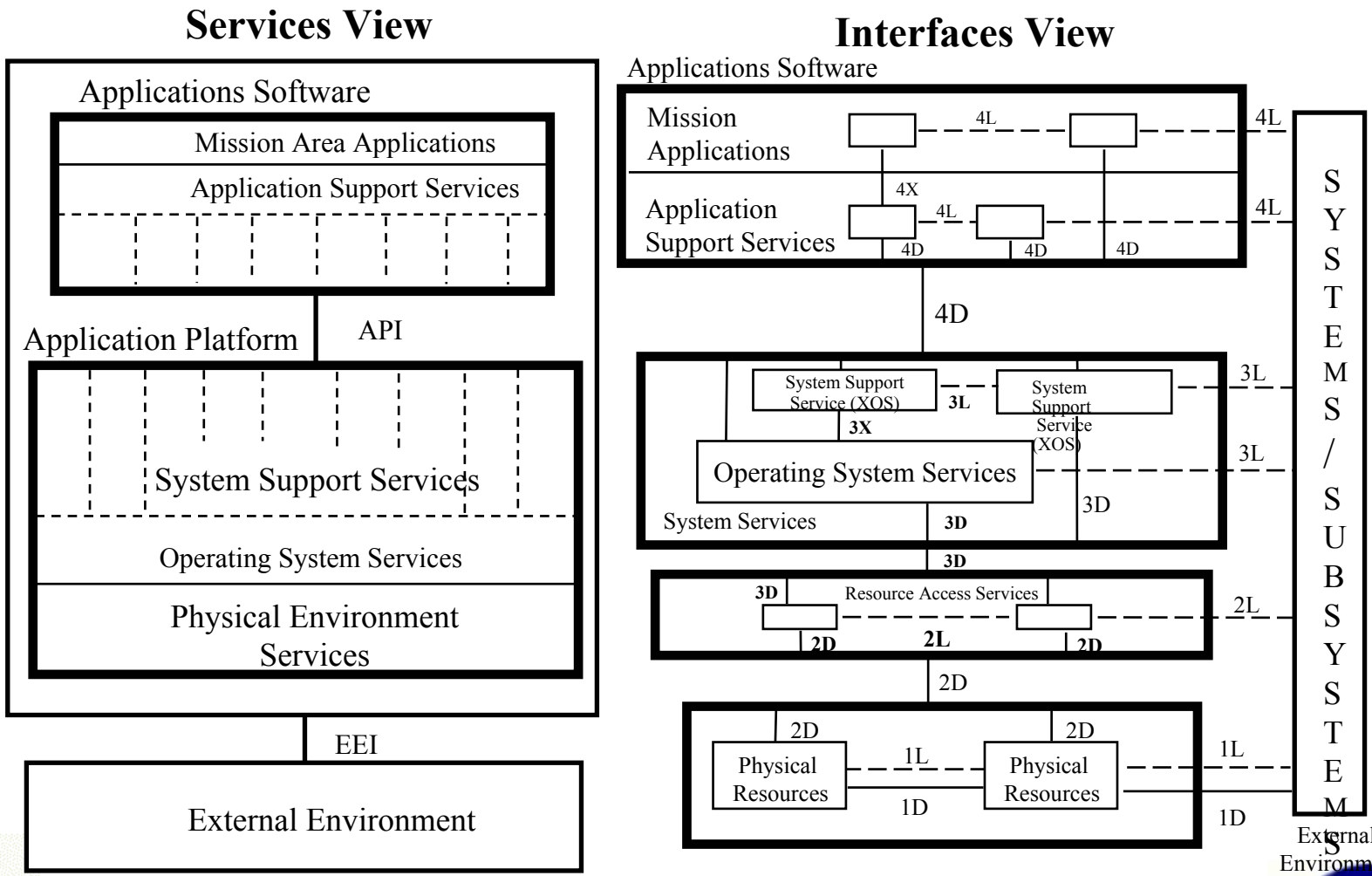
Technical Reference Model Working Group

TAFIM TRM



IT Architecture

DoD Technical Reference Model Version 1.0



IT Architecture

PTO Technical Reference Model

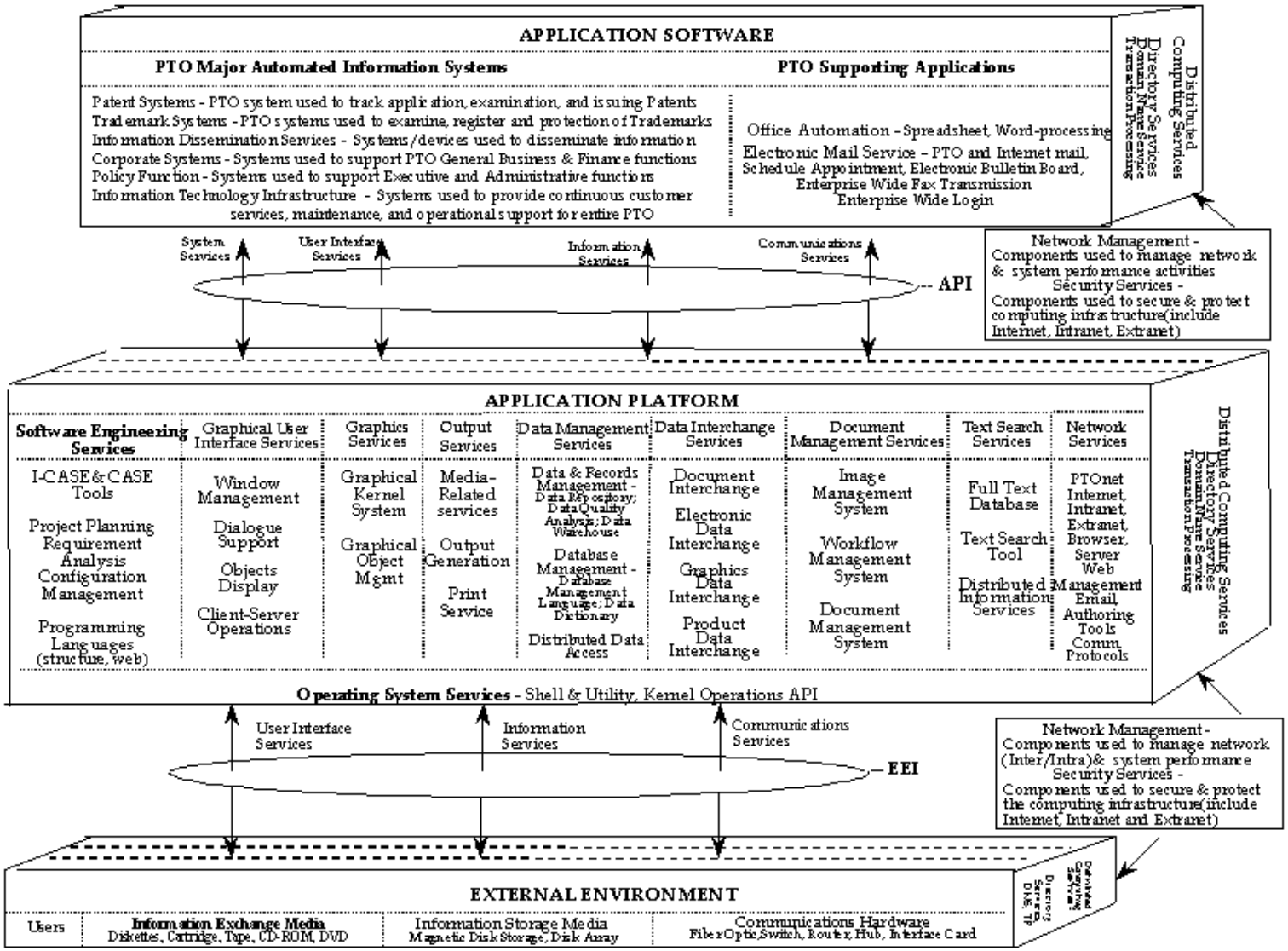


Figure ES-2 PTO Technical Reference Model Detailed Level

IT Architecture

PTO Technical Reference Model

- USPTO Application Platform Services
  - Software Engineering
  - Graphical User Interface
  - Graphics
  - Output
  - Data Management
  - Data Interchange
  - Document Management
  - Text Search
  - Network

PTO Technical Reference Model

IT Architecture

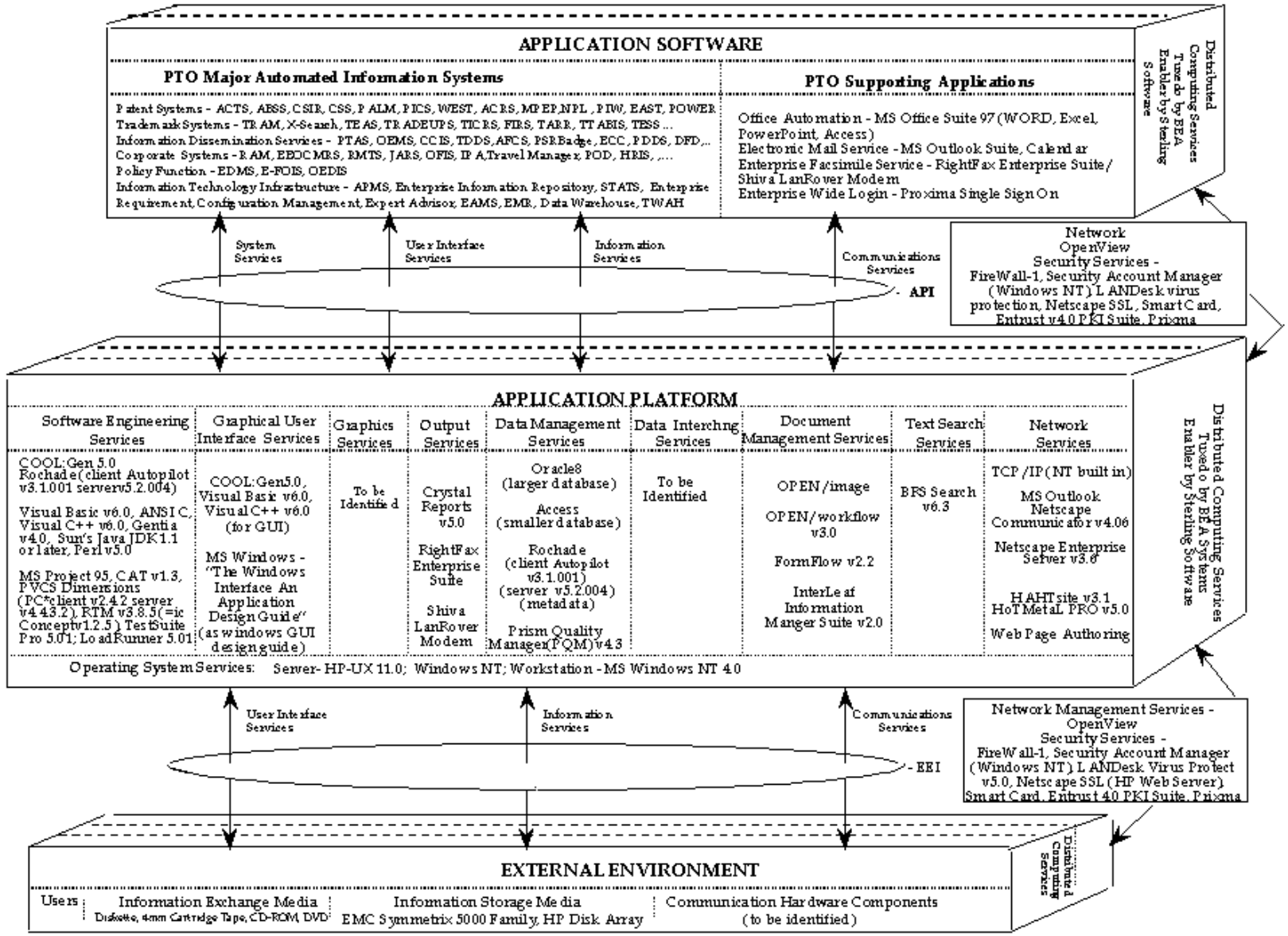


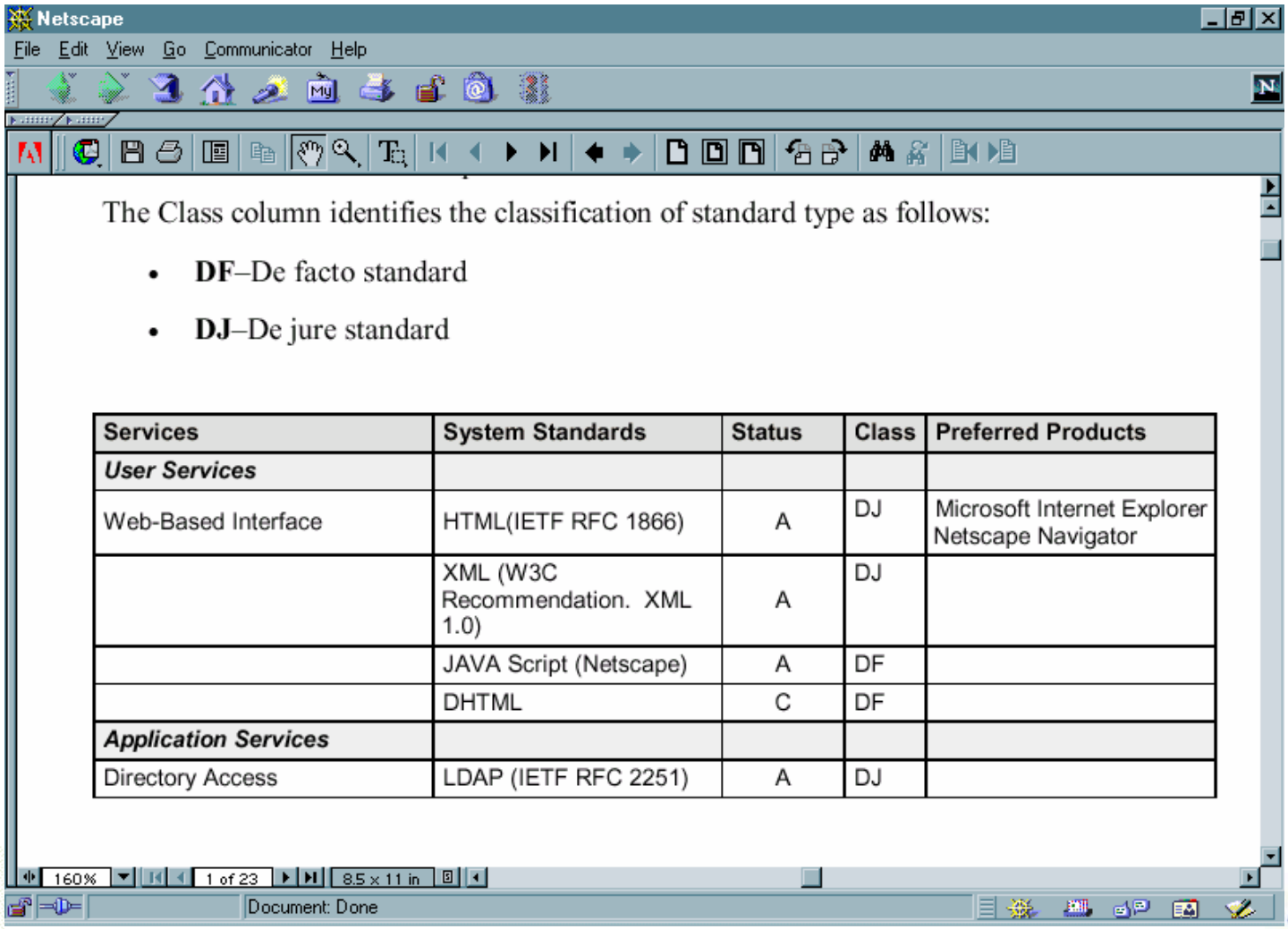
Figure ES-7 PTO Profile of Preferred Products

Standards Profile

- Defines a set of IT standards that supports the services articulated in the Technical Reference Model
  - Establishes minimum criteria needed to specify technology that achieves standardization
  - Published sets of standards or reference source for standards
  - Enables the development and acquisition of standardized systems
  - Leads to cost-effective way to meet business needs of agency
  - *OMB Memorandum M-97-16*

IT Architecture

Standards Profile



Services	System Standards	Status	Class	Preferred Products
User Services				
Web-Based Interface	HTML(IETF RFC 1866)	A	DJ	Microsoft Internet Explorer Netscape Navigator
	XML (W3C Recommendation. XML 1.0)	A	DJ	
	JAVA Script (Netscape)	A	DF	
	DHTML	C	DF	
Application Services				
Directory Access	LDAP (IETF RFC 2251)	A	DJ	

Risk Factors

- **High Risk**
  - Federal CIO Council estimates only 20% of efforts produce real benefits
- **Problem defining the proper scope of efforts**
  - Increases risk of failure
  - Overwhelming
  - Fear of starting
- **Enforcement difficulty**
  - Will fail unless IT Architecture enforcement is done at low levels or in strongly centralized organization
- **Inflexible IT Target Architecture**
  - Do not meet programmatic needs
  - Stifles innovation

Outline

- What is an IT Architecture?
  - Enterprise IT Architecture
  - Technical Reference Model
  - Standards Profile
- **Department of Commerce IT Architecture**
- Lessons Learned

IT Architecture

Department of Commerce (DoC) IT Architecture Affinity Group

- Bureau of Economic Analysis
- Bureau of Export Administration
- Bureau of the Census
- Economic Development Administration
- International Trade Administration
- National Institute of Standards & Technology
- National Oceanic & Atmospheric Administration
- National Telecommunications & Information Agency
- Office of the Chief Information Officer
- Office of the Secretary
- U. S. Patent and Trademark Office

DoC IT Architecture Affinity Group

- Meets regularly on Tuesday mornings for 90 minutes
- Have been meeting since January 11, 1999
- Created DoC IT Enterprise Architecture Home Page: **http://www.hpcc.noaa.gov/docita**
- Another good IT Architecture URL
  - **http://www.itpolicy.gsa.gov/mke/archplus/federal.htm**

IT Architecture

DoC IT Architecture Affinity Group Home Page

IT Architecture: What Is It, Why Should You Care And How Do You Do One?

INFORMATION TECHNOLOGY ARCHITECTURE
WHAT IS IT, WHY SHOULD YOU CARE,
AND HOW DO YOU DO ONE?

What follows is not a definitive guide. There is a plethora of different approaches available and most are much more detailed (sometimes too detailed), and you are encouraged to review them. At the end of this guidance some helpful Web sites are listed. The objective here is to give a fairly simple explanation in plain language of the purpose of an architecture and to outline one process for doing an IT architecture, a process that has already been used by Bureaus and business units within the Department of Commerce.

What is it? Briefly stated, an Information Technology (IT) Architecture is a process for developing and maintaining a blueprint or strategic plan that explains and guides how an organization's IT and information management elements work together to efficiently accomplish the mission of the organization. It is essential to realize that information is a key part of an architecture – an organization may have standards for its IT hardware and software and still not have a complete and effective IT Architecture. Having an IT Architecture with specific technology and information management goals does not mean that an organization must immediately change all of its systems, etc. – part of an IT Architecture is a plan addressing how the organization will migrate to the new targets over time.

IT Architecture

Architecture Development Checklist

1. Identify business processes that will be the bases for architectures if more than one architecture will be done for the bureau.

2. Develop basic ground rules for the designing, building, acquiring, or re-engineering of IT systems, and document as “Architectural Principles”.

3. Ensure that the IT Architecture Principles and other Architecture efforts are consistent with the organization’s Strategic Plan, Strategic IT Plan, and Operational IT Plan, as well as with the Departmental goal of achieving a “Digital Department”.

4. Characterize and document as the “Baseline Architecture”:
   - the current business activities (work) performed, how they are organized, and where they take place;
   - the data sets and information flows needed to perform the activities;
   - the applications and software needed to capture and manipulate the information sets; and
   - the technology (hardware, network, communications) needed to run the applications.

IT Architecture

Architecture Development Checklist

5. Develop a model of what the IT Architecture should be in the future and document as “Target Architecture”.

6. Perform a gap analysis showing where the Baseline Architecture and the Target Architecture differ.

7. Develop a plan to close the gaps between the Baseline and Target Architectures, document as “Migration Plan”. The Plan should include:
    1. assignments of responsibilities, and
    2. milestones for achieving steps in the migration.

8. Create a Technical Reference Model or standards profile to guide acquisitions in a way consistent with the Target Architecture and Migration Plan.

9. Begin implementation of the Migration Plan.

IT Architecture

DoC IT Architecture Affinity Group Current Activities

- Producing minimum set of Commerce-wide IT Architecture Principles
- Developing minimum requirements for:
  - IT Architecture Capability Maturity Model and Audit
  - Technical Reference Model
  - Standards Profile
- Reviewing NOAA's first year architecture documentation

IT Architecture

DoC IT Architecture Affinity Group Assumptions: Success Factors

- Develop a **common vision** amongst senior management on the business and role of IT within the Department
- Derive IT Architecture from Department's **Strategic & Business Requirements**
- Develop and maintain IT Target Architectures at the Business Unit level
- Agree on **mandatory standards** and key information & communication **interfaces**
- Gain understanding that IT Architecture is a **long term process**
  - No immediate requirements for business units to change their systems

Outline

- What is an IT Architecture?
  - Enterprise IT Architecture
  - Technical Reference Model
  - Standards Profile
- Department of Commerce IT Architecture
- **Lessons Learned**

Lessons Learned (Top Five)

- There must be a **shared and mutual vision** with senior managers on the role of the IT Architecture within the Bureau
- Must be in alignment with the Agency's **strategic plan and business requirements**
- Critical to **learn** about IT requirements & IT successes and failures **from all levels of the organization**
- Great **flexibility and creativity** are required to modify the process so that it works for your organization
  - Requires **continuous review and update**
- **Nontechnical challenges are greater** than the technical challenges

Lessons Learned (Continued)

- Defined by IT Principles and Standards
- An orderly and systems approach must be used to develop the IT Enterprise Architecture
- An Internet Home Page is an excellent communications tool
- Invaluable using in-house staff and for NMFS to take the lead directly
- Important to involve as many IT and business staff in the process, as practicable

Lessons Learned (Continued)

- Must begin with a clear definition and understanding of the Organization's vision, IT Principles and business context
- Multi-organizational collaborative efforts are very effective and successful
- The IT Enterprise Architecture process is much more important than the IT Architecture Plan. Technology and business drivers can rapidly change
- **JUST DO IT**

Contact Information

- Department of Commerce IT Architecture Affinity Group
  - **http://www.hpcc.noaa.gov/docita**

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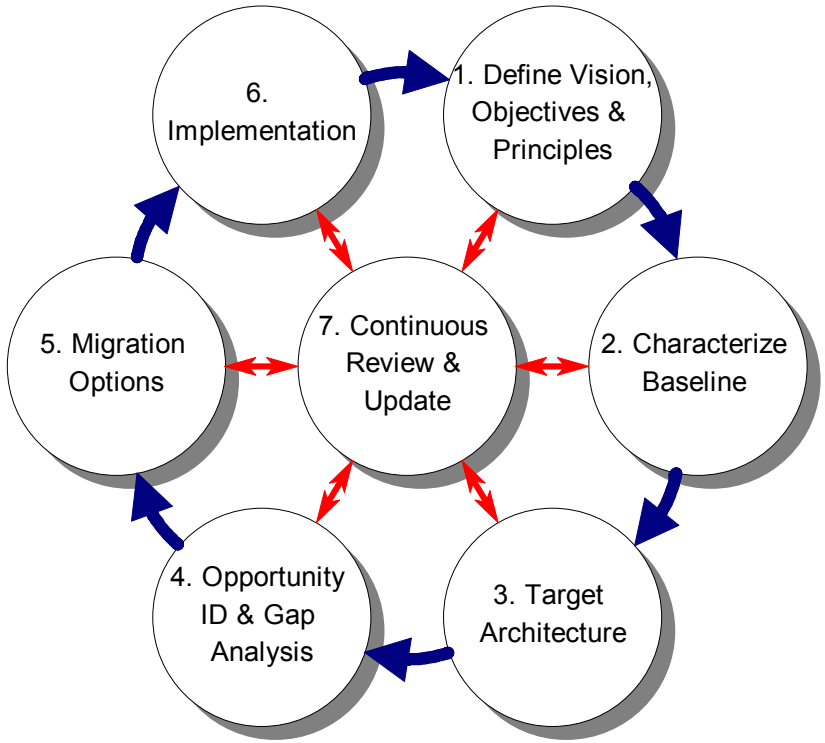
IT Architecture

Wrap-up



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